

obtained with larvæ of a Dyticide (probably of the genus *Colymbetes*) appear to me to prove that in insects the respiratory movements are not, as in the Vertebrata, dependent on a special focus of innervation. On the contrary, each abdominal ganglion is a focus of motory innervation, and takes its part in the performance of the respiratory act in its totality. It is also important to remark that, after the section of the nervous chain, the isolated action of a ganglion appears to be weaker in proportion as this ganglion is united with a smaller number of other ganglionic elements.

Thus we see that in this case experiment only confirms what anatomy might lead us to foresee; for when we consider the distribution of the nervous element in the segments of the thorax and abdomen in the Articulata—when we see, in the Crustacea, the respiratory apparatus occupying the most diverse positions, sometimes on the thorax, sometimes on the abdomen, and receiving its nerves from the most different points, it is hardly possible to assume that in insects there is a single focus of innervation for the respiratory function.

XXXV.—*On Museums, their Use and Improvement, and on the Acclimatization of Animals*; being the Address delivered to the Zoological and Botanical Section of the British Association, at the Bath Meeting, by Dr. J. E. GRAY, President of the Section.

BEFORE entering upon the special business for which the Section has been called together, viz. the consideration of the Reports to be presented upon various zoological and botanical subjects, and the reading of the papers submitted by the members, I should wish to make a few general observations on some topics which appear to me to have an important bearing on the science which we study, in the hope that they may elicit some observations from the members present. I have always felt that one of the most important uses of the Association was the bringing together of so large a body of men engaged in kindred pursuits, and the consequent promotion of free personal intercourse between those who, not inhabiting the same locality or even the same country, were scarcely likely to meet except on such an occasion as the present. In such meetings the free interchange of thought by means of oral communication is most valuable; for it is in this way that facts are most readily brought into notice, and opinions most freely canvassed, that truth is most effectually elicited, and that erroneous or crude ideas are dissipated, corrected, and improved.

Some of my predecessors in this office have given a summary *résumé* of the recent progress of science in the departments over which I have now the honour to preside, and I had at first thought of attempting to follow their example; but I find myself precluded

from so doing by the conviction that, in order to be of any real utility, such a Report should be of much greater length and fulness of detail than the time at our disposal would fairly admit for the reading, or than the few weeks which have elapsed since I was requested to undertake the office would allow of my preparing. This is, however, the less to be regretted, inasmuch as, in the course of each year, a body of laborious and talented German professors are in the habit of preparing a very full and complete Report of this nature for the Berlin 'Archives of Natural History,' after a plan similar to that which I myself commenced, more than forty years ago, in Thomson's 'Annals of Philosophy.' I have therefore abandoned all intention of attempting such a review, and proceed at once to speak of subjects having a more general bearing upon the interests of our science.

I should wish to say a few words on the subject of Public Museums. It may be well imagined that, having the whole of my life been intimately connected with the management of what I believe to be at the present day the most important zoological museum in the world, it is a subject that has long and deeply occupied my thoughts; and it will also be readily believed that it is only after serious and prolonged consideration I have come to the conclusion that the plan hitherto pursued in their arrangement has rendered them less useful to science and less interesting to the public at large than they might have been made under a different system. Let us consider the purposes for which such a museum is established.

These are two: 1st, the diffusion of instruction and rational amusement among the mass of the people; and 2nd, to afford the scientific student every possible means of examining and studying the specimens of which the museum consists. Now, it appears to me that, in the desire to combine these two objects, which are essentially distinct, the first object, namely the general instruction of the people, has been to a great extent lost sight of and sacrificed to the second, without any corresponding advantage to the latter, because the system itself has been thoroughly erroneous. The curators of large museums have naturally, and, perhaps, properly, been men more deeply devoted to scientific study than interested in elementary instruction, and they have consequently done what they thought best for the promotion of science by accumulating and exhibiting on the shelves or in the open cases of the museum every specimen which they possess, without considering that by so doing they were overwhelming the general visitor with a mass of unintelligible objects, and at the same time rendering their attentive study by the man of science more difficult and onerous than if they had been brought into a smaller space and in a more available condition.

What the largest class of visitors, the general public, want, is a collection of the more interesting objects so arranged as to afford the greatest possible amount of information in a moderate space, and to be obtained, as it were, at a glance. On the other hand, the scientific student requires to have under his eyes and in his hands the most

complete collection of specimens that can be brought together, and in such a condition as to admit of the most minute examination of their differences, whether of age, or sex, or state, or of whatever kind that can throw light upon all the innumerable questions that are continually arising in the progress of thought and opinion.

In the futile attempt to combine these two purposes in one consecutive arrangement, the modern museum entirely fails in both particulars. It is only to be compared to a large store or a city warehouse, in which every specimen that can be collected is arranged in its proper case and on its proper shelf, so that it may be found when wanted; but the uninformed mind derives little instruction from the contemplation of its stores, while the student of nature requires a far more careful examination of them than is possible under such a system of arrangement, to derive any advantage; the visitor needs to be as well informed with relation to the system on which it is based as the curator himself; and consequently the general visitor perceives little else than a chaos of specimens, of which the bulk of those placed in close proximity are so nearly alike that he can scarcely perceive any difference between them, even supposing them to be placed on a level with the eye, while the greater number of those which are above or below this level are utterly unintelligible.

To such a visitor, the numerous species of rats, or squirrels, or sparrows, or larks that crowd the shelves, from all parts of the world, are but a rat, a squirrel, a sparrow, or a lark; and this is still more especially the case with animals of a less marked and less known type of character. Experience has long since convinced me that such a collection so arranged is a great mistake. The eye both of the general visitor and of the student becomes confused by the number of the specimens, however systematically they may be brought together.

The very extent of the collection renders it difficult even for the student, and much more so for the less scientific visitor, to discover any particular specimen of which he is in quest; and the larger the collection, the greater this difficulty becomes. Add to this the fact that all specimens, but more especially the more beautiful and the more delicate, are speedily deteriorated, and in some cases destroyed for all useful purposes, by exposure to light, and that both the skins and bones of animals are found to be much more susceptible of measurement and comparison in an unstuffed or unmounted state, and it will be at once apparent why almost all scientific zoologists have adopted for their own collections the simpler and more advantageous plan of keeping their specimens in boxes or in drawers, devoted each to a family, a genus, or a section of a genus, as each individual case may require.

Thus preserved and thus arranged, the most perfect and the most useful collection that the student could desire would occupy comparatively a small space, and by no means require large and lofty halls for its reception. As it is desirable that each large

group should be kept in a separate room, and as wall-space is what is chiefly required for the reception of the drawers or boxes, rooms like those of an ordinary dwelling-house would be best fitted for the accommodation of such a collection and of the students by whom it would be consulted—one great advantage of this plan being that students would be uninterrupted by the ignorant curiosity of the ruder class of general visitors, and not liable to interference from scientific rivals.

There are other considerations also which should be taken into account in estimating the advantages of a collection thus preserved and thus arranged. A particular value is attached to such specimens as have been studied and described by zoologists, as affording the certain means of identifying the animals on which their observations were made. Such specimens ought especially to be preserved in such a way as to be least liable to injury from exposure to light, dust, or other extraneous causes of deterioration; and this is best done by keeping them in a state least exposed to these destructive influences, instead of in the open cases of a public and necessarily strongly lighted gallery.

Again, the amount of saving thus effected in the cost of stuffing and mounting is well worthy of serious consideration, especially when we take into account that this stuffing and mounting, however agreeable to the eye, is made at the cost of rendering the specimens thus operated upon less available for scientific use.

All these arguments go to prove that, for the purposes of scientific study, the most complete collection that could possibly be formed would be best kept in cabinets or boxes from which light and dust would be excluded, in rooms especially devoted to the purpose, and not in galleries open to the general public, and that such an arrangement would combine the greatest advantage to the student and the most complete preservation of the specimens with great economy of expense.

This being done, it is easy to devise the plan of a museum which shall be the most interesting and instructive to general visitors, and one from which, however short may be their stay, or however casual their inspection, they can hardly fail to carry away some amount of valuable information.

The larger animals, being of course more generally interesting, and easily seen and recognized, should be exhibited in the preserved state, and in situations where they can be completely isolated. This is necessary also on account of their size, which would not admit of their being grouped in the manner which I propose with reference to the smaller specimens.

The older museums were for the most part made up of a number of the square glass-fronted boxes, each containing one, or sometimes a pair of specimens. This method had some advantages, but many inconveniences—among others, that of occupying too large an amount of room. But I cannot help thinking that when this was given up for the French plan of attaching each specimen to a sepa-

rate stand, and marshalling them like soldiers on the shelves of a large open case, the improvement was not so great as many suppose; and this has become more and more evident since the researches of travellers and collectors have so largely increased the number of known species, and of species frequently separated by characters so minute as not to be detected without careful and close examination.

Having come to the conclusion that a museum for the use of the general public should consist chiefly of the best-known, the most marked, and the most interesting animals, arranged in such a way as to convey the greatest amount of instruction in the shortest and most direct manner, and so exhibited as to be seen without confusion, I am very much disposed to recur to something like the old plan of arranging each species or series of species in a special case, to be placed either on shelves or tables, or in wall-cases, as may be found most appropriate, or as the special purpose for which each case is prepared and exhibited may seem to require.

But instead of each case, as of old, containing only a single specimen, it should embrace a series of specimens, selected and arranged so as to present a special object for study; and thus any visitor, looking at a single case only, and taking the trouble to understand it, would carry away a distinct portion of knowledge, such as in the present state of our arrangements could only be obtained by the examination and comparison of specimens distributed through distant parts of the collection.

Every case should be distinctly labelled with an account of the purpose for which it is prepared and exhibited; and each specimen contained in it should also bear a label indicating why it is there placed.

I may be asked, why should each series of specimens be contained in a separate case? but I think it must be obvious that a series of objects exhibited for a definite purpose should be brought into close proximity, and contained in a well-defined space; and this will best be done by keeping them in a single and separate case. There is also the additional advantage that whenever, in the progress of discovery, it becomes desirable that the facts for the illustration of which the case was prepared should be exhibited in a different manner, this can easily be done by rearranging the individual case without interfering with the general arrangement of the collection. I believe that the more clearly the object is defined and the illustrations kept together, the greater will be the amount of information derived from it by the visitor and the interest he will feel in examining it.

Such cases may be advantageously prepared to show—

The classes of the animal kingdom, by means of one or more typical or characteristic examples of each class.

The orders of each class.

The families of each order.

The genera of each family.

The sections of each genus.

A selection of a specimen of each of the more important or striking species of each genus or section.

The changes of state, sexes, habits, and manners of a well-known or an otherwise interesting species.

The economic uses to which they are applied; and such other particulars as the judgment and talent of the curator would select as best adapted for popular instruction, and of which these are only intended as partial indications.

No one, I think, who has ever had charge of a museum, or has noted the behaviour of the visitors while passing through it, can doubt for a moment that such cases would be infinitely more attractive to the public at large than the crowded shelves of our present museums, in which they speedily become bewildered by the multiplicity, the apparent sameness, and at the same time the infinite variety of the objects presented to their view, and in regard to which the labels on the tops of the cases afford them little assistance, while those on the specimens themselves are almost unintelligible.

When such visitors really take any interest in the exhibition, it will generally be found that they concentrate their attention on individual objects, while others affect to do the same, in order to conceal their total want of interest, of which they somehow feel ashamed, although it originates in no fault of their own.

I think the time is approaching when a great change will be made in the arrangement of Museums of Natural History, and have therefore thrown out these observations as suggestions by which it appears to me that their usefulness may be greatly extended.

In England, as we are well aware, all changes are well considered and slowly adopted. Some forty years ago, the plan of placing every specimen on a separate stand, and arranging them in rank and file in large glass wall-cases, was considered a great step in advance, and it was doubtless an improvement on the preexisting plan, especially at a time when our collections were limited to a small number of species, which were scarcely more than types of our modern families or genera.

The idea had arisen that the English collections were smaller than those on the Continent, and the public called for every specimen to be exhibited. But the result has been that, in consequence of the enormous development of our collections, the attention of the great mass of visitors is distracted by the multitude of specimens, while the minute characters by which naturalists distinguish genera and species are inappreciable to their eyes.

It was not, however, the unenlightened public only who insisted on this unlimited display; there were also some leading scientific men who called for it, on the ground that the curator might be induced to keep specimens out of sight in order to make use of them for the enlargement of his own scientific reputation while the scientific public were debarred the sight of them, and that valuable specimens might thus be kept, as the favourite phrase was, "in the cellars." But any such imputation would be completely nullified by

the plan which I have proposed of placing all the specimens in the scientific collection in boxes or drawers appropriated to them, and rendering them thus at once and readily accessible to students at large.

I may observe that the late Mr. Swainson, who was the first to raise the cry, lived to find that it was far more useful to keep his own extensive collection of bird-skins in drawers, like his butterflies and his shells; and that most scientific zoologists and osteologists are now convinced that the skins of animals unmounted and kept in boxes are far more useful for scientific purposes than stuffed skins or set-up skeletons.

So also, with reference to my proposal for the arrangement of the Museum for the general public, I find that those who are desirous of exhibiting their specimens to the best advantage are generally adopting similar plans.

Thus, when Mr. Gould determined on the exhibition of his magnificent collection of Humming-birds, he at once renounced the rank-and-file system, and arranged them in small glazed cases, each case containing a genus, and each pane or side of the case showing a small series of allied species, or a family group of a single species.

When lately at Liverpool, I observed that the clever curator, Mr. Moore, instead of keeping a single animal on each stand, has commenced grouping the various specimens of the same species of Mammalia together on one and the same stand, as several are grouped in the British Museum, and thus giving far greater interest to the group than the individual specimens would afford.

In the British Museum, as an experiment with the view of testing the feelings of the public and the scientific visitors, the species of Nestor Parrots and of the Birds of Paradise, a family of Gorillas and the Impeyan Pheasants, and sundry of the more interesting single specimens, have been placed in isolated cases; and it may readily be seen that they have proved the most attractive cases in the exhibition.

In the Great Exhibition of 1862, Prof. Hyrtl of Vienna exhibited some framed cases of skeletons like those here recommended: one contained the types of each family of Tortoises, another the principal forms of Saurians, &c. They excited much interest, and were purchased by our College of Surgeons.

In some of the Continental museums also I have observed the same plan adopted to a limited extent.

I now exhibit a case of insects, received from Germany, in which what I have suggested is fully carried out. You will perceive that in one small case are exhibited simultaneously, and visible at a glance, the egg, the larva, the plant on which it feeds, the pupa, and the perfect moth, together with its varieties, and the parasites by which the caterpillar is infested. Such cases, representing the entire life and habits of all the best-known and most interesting of our native insects, would be, as I conceive, far more attractive and instructive to the public at large than the exhibition of any con-

ceivable number of rows of allied or cognate species, having no interest whatever except for the advanced zoological student.

I will only add that I am perfectly satisfied, from observation and experience, and that I believe the opinion is rapidly gaining ground, that the scientific student would find a collection solely devoted to the object of study, and preserved in boxes and drawers, far more useful and available for scientific purposes than the stuffed specimens as at present arranged in galleries of immense extent, and crowded with curious and bewildered spectators; while, on the other hand, the general public would infinitely better understand, and consequently more justly appreciate, a well-chosen and well-exhibited selection of a limited number of specimens, carefully arranged to exhibit special objects of general interest, and to afford a complete series for elementary instruction, than miles of glass cases containing thousands upon thousands of specimens, all exhibited in a uniform manner, and placed like soldiers at a review.

I now turn to a very different subject—one which has always occupied a considerable share of my attention, and on which a few observations may not be out of place on this occasion—viz. the acclimatization of animals. This subject, which has been a favourite one with the more thoughtful student, appears all at once to have become popular; and several associations have been formed for the especial purpose of its promotion, not only in this country, but also on the Continent and in the Australian colonies.

I may observe that the acclimatization of animals, and especially the introduction and cultivation of fish, was among the peculiar objects put forward by the Zoological Society at the time of its foundation, nearly forty years ago—although, as we all know, it has been able to do very little for its promotion.

It would appear, from observations that are occasionally to be met with in the public papers and in other journals, to be a prevalent opinion among the patrons of some of these associations that scientific zoologists are opposed to their views, or, at least, lukewarm on the subject. But I am convinced that they are totally mistaken in such a notion, and that it can only have originated in the expression of a belief, founded on experience, that some of the schemes of the would-be acclimatizers are incapable of being carried out, and would never have been suggested if their promoters had been better acquainted with the habits and manners of the animals on which the experiments are proposed to be made.

The term acclimatization has been employed in several widely different senses:—1st, as indicating the *domestication* of animals now only known in the wild state; 2ndly, to express the *introduction* of the domesticated animals of one country into another; 3rdly, the *cultivation* of fishes, &c., by the restocking of rivers, the colonization of ponds, or the renovating of worn-out oyster- or pearl-ferries by fresh supplies.

Commencing with the first of these objects, which is by many regarded as the most important, I would observe that some animals

seem to have been created with more or less of an instinctive desire to associate with man, and to become useful to him; but the number of these is very limited, and as it undoubtedly takes a long period to become acquainted with the qualities and habits of these animals, and with the mode in which their services may be rendered available, it would almost appear as if all the animals which are possessed of this quality, and are worth domesticating, had already been brought into use. Indeed all those which are now truly domesticated were in domestication in the earlier historic times. The Turkey, it may be said, was not known until the discovery of America; but I think it has been satisfactorily proved that our domestic Turkey is not descended from the wild Turkey of America, but comes of a race which was domesticated by the Mexicans before the historic period. Again, the number of such animals is necessarily limited; for it is not worth while to go through a long process of domestication with the view of breeding an animal that is not superior in some important particular to those which already exist in domestication. For example, where would be the utility of introducing other Ruminants which do not breed as freely, feed as cheaply, afford as good meat, and bear the climate as well as our present races of domestic cattle?

It has been thought that some of the numerous species of African Antelopes might be domesticated here; but every one who has eaten their flesh describes it as harsh and dry, and without fat; and such being the case (even could the domestication be effected, which I very much doubt), such an animal must have some very valuable peculiarity in its mode of life, and be capable of being produced at a very cheap rate, to enable it to take rank in our markets beside the good beef and mutton with which they are at present supplied; and, even supposing it to be semidomesticated only for the park, it could not for an instant be put in competition with the fine venison which it is thought that it might displace.

I am aware that certain French philosophers have lately taken up a notion that it is desirable to pervert the true purposes of the Horse by cultivating him for food instead of work; and that a society of *Hippophagi* has been instituted with this view. Of course, under present circumstances, the flesh of old and worn-out horses is sold for much less than that of well-fed Ruminants; and the *miserable* classes in some countries are glad to obtain animal food of any kind at so low a rate: but whenever an attempt has been made to fatten horses for food, it has been found that the meat could not be produced at so low a rate as that for which far better beef and mutton could be bought.

There are also some small semidomesticated animals, such as the Porcupine and other *Glires*, which are said to afford good meat; but they have long been driven out of the market by the cheapness and abundance of the prolific Rabbit.

With regard to the larger Ruminants (such as the Giraffe, the Eland and some other foreign Deer, the Llama, and the Alpaca), which have been bred in this country, but never brought into

general use, I cannot consider them as at all acclimatized. They have almost always had the protection of warmed buildings, especially in the winter; and though they may have lived through a certain number of years, they are liable to attacks of diseases dependent upon our climate, and generally die off before their natural term of existence is completed. I can only regard them as partially domesticated, and that only as objects of curiosity and luxury, and as incapable of being turned, in this country at least, to any useful domestic purpose.

With regard to those animals which may be considered as more or less completely under the control of Man, there exists considerable difference in the nature of their domestication.

The more typical among them, or truly domesticated, such as the Oxen, the Sheep, the Horse, the Camel, the Dog, and the Cat, like the Wheat and the Maize among plants, are never found truly wild; and when they are permitted to run wild, as in the case of horses and oxen in South America, they are easily brought back to a state of domestication, especially if caught young. What may be called the semidomesticated or domesticable animals, such as the Buffalo, the Goat, the Pig, the Rabbit, the Reindeer, the Yak, and some other Asiatic cattle, are found both in the tame and the wild state, and often in the same region and in close proximity to each other. The Asiatic Elephant, and a few other animals which can be made tractable under man's direction, never (or very rarely) breed in domestication; and all the individuals of these very useful races are caught wild and brought into subjection by training. The African Elephant is evidently equally amenable to man's control, and was equally domesticated by the Romans; but the negroes do not seem to appreciate the advantages which they might derive from its domestication, and only make use of its tractable disposition to keep it in captivity until such time as its ivory is best fitted for the market, when, also they, can feed upon its flesh.

All our domestic or semi-domestic animals have their proper home in the temperate regions of Europe and Asia. They all, except the Ass, bear great cold better than excessive heat; and even the Ass suffers greatly on the coasts of the tropics. The Sheep, in the warmer regions, require to be driven to the cool mountains during the hot season. In the tropics they lose their wool, and, like the long-haired goats and dogs, change the character of their fur. The inhabitants of the arctic region or subarctic regions of Europe and Asia have partially domesticated the Reindeer.

Either Asiatics have a peculiar aptitude for domesticating animals, or the Ruminants of that part of the world are peculiarly adapted for domestication. In the mountain regions of Tibet and Siberia the Yak has been domesticated, and, like the Reindeer of the arctic regions, it is used as a beast of burthen as well as for milk and food. The steppes of Asia are the home of the Camel and the Dromedary. In the lower and warmer regions of central and southern Asia the Zebu has been completely domesticated; and the natives of India and of the islands of the Malayan archipelago have brought into a

semidomesticated state various species of wild cattle, such as the Gyal, the Gour, and the Banting, and have even obtained some hybrid breeds between some of them and the Zebus, as well as the Buffalo, which they have in common with Africa and the south of Europe. In the park of the Governor-General of India there are large herds of the Black Antelope, the Axis Deer, and the Porcine Deer in a semi-domestic state; and our officers found in the park of the Emperor of China at Peking more than one species of domesticated native Deer. We have as yet received from Japan only one peculiar species of domestic animal, viz. a Pig with a plaited face (*Sus plicatus*); but it is not unlikely that the Deer called *Cervus Sika* is a domesticated species, like the *Cervus Swinhooi* of Formosa. In Celebes there is a small Buffalo called *Anoa*; and in the same island, as well as in Java and some of the other islands of the Indian Ocean, most of the aboriginal pigs, including the Babirusa, have been more or less completely domesticated. These numerous instances will suffice to show how largely Asiatics have been enabled to draw around them for additions to their domestic or half-domestic races; but a glance at the habits and manners of most of them will suffice to show how little they would be suited to our more northern climate, and how small would be the advantage gained were it possible to introduce them here.

Africa has only sent to Europe the Guinea-fowl, that vagrant from our farm-yards; but it too has some domesticated animals of its own. In the more fertile and well-watered parts of that continent there exist at least five different kinds of domestic cattle:—the Buffalo (*Bos Bubalus*) and humpless cattle, which appear to be of the same species and to be derived from the same source as the Buffalo and domestic Oxen of Europe. The African Zebu (*Bos Dante*) appears to be distinct from the Zebu of India, and is probably an indigenous domestic race; and the long-eared bush-cattle, or Zamous (*Bos brachyceros*), are certainly an aboriginal species peculiar to tropical Africa. Besides these, it has, in the Desert regions, the Camel in common with Asia: this animal is also partially domesticated in the southern parts of Europe.

America had only three or (if we reckon the Dog) at most four domestic animals belonging to the country before it was discovered by Europeans, who have, however, since introduced into it most of those which they themselves previously possessed. The Turkey was only domesticated by the native Mexicans; and it may be observed that in Europe these birds have only been imperfectly naturalized, requiring peculiar care and attention in their early stages to protect them from the effects of an ungenial climate. The Llama and Alpaca were also early domesticated by the native Peruvians; and it would appear as if these animals would not bear transportation to other quarters. All the attempts, at least, which have hitherto been made to introduce them into Europe and Australia have resulted in failure. The Esquimaux inhabiting the more northern regions have a peculiar race of dogs, which are in the highest degree useful to them; but it appears to be of the same original stock with the dogs of Europe, and had probably passed from one continent to the other.

In some parts of this vast continent, the Oxen and the Horse, since their introduction from Europe, have so firmly established themselves in a half-wild state as to be often hunted and killed for their hides alone.

Australia and the islands of the Pacific have no native domestic animals, if we again except the Dog; and Australia alone has any mammals sufficiently large to be hunted for their flesh. There formerly existed in New Zealand a large bird (the Moa) which was eaten by the natives; but it seems to have been exterminated, or nearly so, before the colonization of the islands.

European animals have been largely and advantageously introduced throughout the Pacific Ocean, and in some cases have become wild and even dangerous.

As in Europe, all the domestic animals of these various parts of the world appear to have been brought into their present condition for many ages, inasmuch as they were all found in a domestic state when the several countries were first visited by Europeans.

And an attentive study of the list, and of the peculiarities of the animals composing it, induces me to believe that, in attempting to introduce new domestic animals into some of our colonies, it would be desirable not to confine ourselves to the European breeds, but to ascertain whether some of the domestic races of Asia or Africa might not be better adapted to the climate and other conditions of the colony, although, for reasons to which I have before adverted, it would neither be worth the trouble, nor consistent with good policy, to attempt their introduction here.

There is evidently ample room for such experiments, which might be advantageously made, for instance, in the colonies of the coast of Africa, where our horse, ass, oxen, sheep, and goats, and even dogs have greatly degenerated, where the horse and the ass live only for a brief period, where the flesh of the ox and sheep is described as bad and rare, and the flesh of the goat, which is more common, is said to be tasteless and stringy. The pig alone, of all our domestic animals, seems to bear the change with equanimity; and the produce of the "milch pig" is often sold to passengers of the mail packets and the ships on the stations, as the milk of the cow or even the goat is rarely to be obtained. Unfortunately both the white and the black inhabitants are merely sojourners in the land, and do not seem to possess sufficient energy or inclination to make the experiment themselves.

Secondly, as regards the *introduction* of the domestic races of one country into another, there can be no doubt that this is a much more important object in relation to our Australian colonies, and other settlements planted in waste lands, than it is to the old countries, such as all the European states, and that it has been pursued, as far as they are concerned, with great success. Dr. George Bennett, in the third annual 'Report of the Acclimatization Society of New Holland,' has well observed, "We have lately heard of acclimatization dinners in London and other places, but a dinner in New South Wales of food naturalized in the colony occurs every day, and a finer

display cannot be surpassed in any country." Few countries were so badly supplied by nature with useful animals and plants as the Australian continent; and while we do not receive in Europe a single indigenous product for our tables, either animal or vegetable, from Australia, which in this respect has added nothing to the comforts of civilized man, no country has been more richly supplied with the useful products of other parts of the world; for not only have the natural productions of the temperate regions of Europe been largely introduced, but even the flowers and fruits of tropical and subtropical regions.

There is no doubt that the introduction into Australia of animals long domesticated in Europe is far more easy than that of semi-domesticated animals from countries in a ruder state of society. Perhaps this may explain why the leading animals and plants to which Dr. Bennett refers in this Report, and which, be it observed, have all been introduced by individual enterprise, have succeeded so much better than the later attempts to introduce such animals as the Llama and various ornamental Mammalia and birds. Among other attempts referred to are the blackbirds, thrushes, starlings, and skylarks of Europe: these latter seem to be established in the Botanic Garden, but it is doubtful whether such birds can find their appropriate food except in cultivated gardens or near the towns.

On the other hand, it is to be observed that the introduction into a new country of domestic or semidomestic animals is not always an unmixed advantage. Thus, the domestic pig has been completely naturalized in New Zealand: there its great multiplication has rendered it so mischievous a pest to the sheep-farmer, from its following the ewes and eating the newly dropped lambs, that the flock-masters have been compelled to employ persons to destroy the pigs, paying for their destruction at the rate of so much per tail; many thousands are thus destroyed in a single season. Indeed it has been proved by Dr. Hooker's interesting paper "On the Replacement of Species" that the introduction of a new animal or plant often results in its destroying and taking the place of some previous inhabitant, thus rendering its introduction a matter of doubtful advantage, or at all events a question to be approached with considerable caution.

It is, however, manifest that, on the whole, more useful results are to be obtained from the introduction of races already domesticated into countries to which they have not reached, than from the attempt to acclimatize animals for the most part either unsuited to the climate or capable only of an inferior degree of domestication, or inferior in quality to those which are already in possession of the ground.

Under the *third* head, the *cultivation* of fish, I have very little to observe, although the subject is unquestionably one of great importance. But as yet we have very little practical information upon the question; and I consider that the advocates of the system are only for the present feeling their way, as the experiments have not been pursued for a sufficient length of time to produce any positive or reliable results. To replenish rivers in which the fish which formerly inhabited them have been destroyed, it is necessary closely

to study the habits of the fish, and to imitate as much as possible their natural proclivities.

Thus, for example, it appears to me that, when attempting to introduce young artificially hatched fish into a river, we should place them in the smallest streamlets, where the fish would themselves deposit their ova, and not in the wider parts of the stream, where they are liable to injury from various causes. Again, the notion of fishing the breeding-fish out of a river, collecting their eggs and artificially impregnating them, seems to me an unnatural mode of proceeding, and such as is not practised in the cultivation of any other animal. I cannot see any practical advantage that can possibly be derived from it.

For the replenishing of worn-out fisheries of oysters and pearl-shells, all that seems necessary or advantageous to be done is to place round the bed twigs and various similar substances so arranged as to retain the eggs when deposited, and to protect them by all the means in our power, leaving the beds undisturbed for a sufficient time to allow the new brood to become firmly established in them.

Besides the numerous attempts at home to replenish our rivers and oyster-beds, much has been written and large sums have been expended in trying to introduce salmon into the rivers of Australia; but the many failures show how little those who undertook the task were acquainted with the most common physiological questions connected with the removal of fish, and how small was their knowledge of the habits and peculiarities of the fish which they proposed to remove. What, indeed, could be more absurd than the attempt to introduce salmon into rivers which for a considerable part of the year are reduced to a series of stagnant pools. I think I may venture to predict that, if ever salmon are introduced into Australia, they are much more likely to succeed in the deep and rapid rivers of Tasmania than in the streams of Australia proper. At the same time, when we consider the very limited geographical range of the salmon in Europe, confined as it is to those rivers which have their exit into the North Sea, that the attempt to remove it from one river to another in Europe has always been a failure, and that it is not only necessary that the salmon should have a river similar to that which it inhabits here, but also the same food and other peculiarities, without which apparently it cannot subsist, I must confess that I have no great faith in the success of the introduction of the salmon into Australia. I think, therefore, that it is to be regretted that the Australian Acclimatization Society do not rather make some experiments on the introduction of the gouramy, or some of the other edible fish of countries nearer to and more resembling their own.

With other members of the British Association, I have received a reprint of the Rules of Nomenclature drawn up by Mr. Strickland and others, and printed in the Report of the twelfth Meeting of the Association (1842), accompanied with a request to examine them carefully, and to communicate any suggestions to Sir William Jardine, Bart.

I can only repeat the suggestion I made when the rules were under the consideration of the Committee of the Natural History Section of Manchester, viz. that the rules be not adopted until they have been compared with Linnæus's 'Philosophia Botanica,' Fabricius's 'Philosophia Entomologica,' Illiger's 'Prodromus,' and DeCandolle's 'Théorie Élémentaire,' and that when they are not in conformity with the laws proposed by these authors, which have been accepted by all recognized systematic naturalists, the reasons for the proposed alterations should be given in detail. After some discussion, my suggestion was adopted, and the report was remitted to the Committee to carry it out.

The rules were inserted in the printed Report, through the personal influence of Mr. Strickland, who was then a member of the Council, but they never received the sanction of the British Association.

In the 'American Journal of Science and Art' for March 1864 [reprinted in the 'Annals' for June, 1864.] there are some admirable observations by Dr. Asa Gray on some of these rules, which entirely accord with my own views, and which I recommend to the consideration of the Committee.

In conclusion, I would request you kindly to bear in mind that I have simply thrown these observations together in the hope of eliciting the opinions of my colleagues in the Section.

My only desire is that we may all heartily concur in doing all that is in our power to render this and other institutions conducive to the increase of the knowledge, the happiness, and the comforts of the people.

BIBLIOGRAPHICAL NOTICES.

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THOUGH the Naturalists' Field-Club of Tyneside cannot rank as the first established among the many kindred clubs that now exist in Great Britain, it would yet appear to be winning, if it has not already won, the premier place, when estimated by the value of its published Transactions. Other field-clubs may possess a larger number of members, more funds, and even greater popularity; but we know of none that is so carefully carrying out the objects for which it was founded, or whose Transactions contribute more to the progress of natural history than this society of naturalists on the banks of the Tyne.

The work which its founders, some eighteen years ago, carved out for it to accomplish was, first, to promote and foster a general taste for natural-history pursuits, and, secondly, to investigate the natural history of Tyneside and the neighbouring district, the results of which were to be published in the Transactions. How far they have, in the latter case, worked out their plan may be judged of by the fact that the Mammalia, Mollusca, Coleoptera, Lepidoptera, Zoophyta, Marine Algæ, and Permian fossils have all been carefully